AIRS/AMSU/HSB NWP Products

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Objectives of AIRS near-real time processing

- Provide AIRS data to NWP centers in near-real-time --- generally 3 hours from observation time
- Early demonstration of processing and utilization of high spectral resolution infrared data
- Early impact assessment on NWP models
- Backup software to process CrIS on NPP and IASI
- Science investigations

Science Investigations

- Data compression.
- Validate and improve radiative transfer calculations.
- Cloud detection and clearing.
- Use of imager to improve cloud detection
- Channel selection (super channels).
- Validate and improve retrieval algorithms.
- Forecast impact studies

Key Partners

- Key Partners –IPO, NASA , JPL , AIRS Science Team and NWP centers
- NASA provides data-stream to NOAA computer
- AIRS Science team developed the science algorithms
- JPL converted science code to operational code
- NWP centers defined product files for their data assimilation and will provide feedback.
- NESDIS provides AIRS data (retrievals and radiances) in near-real time and validation/improvements to algorithms

AIRS NWP Customers

- NCEP
- UK Meteorological Office
- ECMWF
- Meteo-France
- Goddard DAO
- Canadian Meteorological Service

Work accomplished

- Defined NWP product files
- Upgraded 8 CPU SGI Origin 2000 to 32 CPUs
- Implemented near real-time (NRT) generation of simulated AIRS/AMSU-A and HSB and NWP product files
- Developed web-site - displays thinned radiance product file (228 AIRS channels) and thinned principal component (pc) scores file, pc regression retrievals of temperature, moisture and ozone.
- Radiance product file is in BUFR and is available on anonymous ftp site (last 24 hours of data)

AIRS Orbital Data Sets

- Derived from the operational NCEP global model.
- Includes temperature at 26 levels (1015 mb to 3 mb)

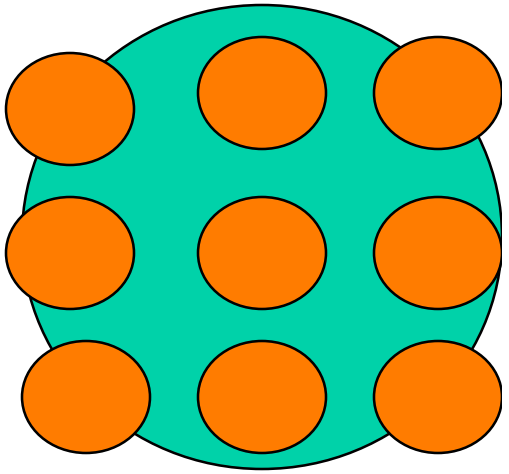
  water vapor at 21 levels

  ozone at 6 levels
- Water is extrapolated to top of the atmosphere.
- UARS climatology is appended to the temperature above 3 mb.
- Data is interpolated to AIRS 3 x 3 locations within AMSU fov.

AIRS Orbital Data Sets

- Includes surface topography and variable surface pressure
- Daytime and nighttime conditions
- T(p),q(p),o3(p) from surface to .005 mb.
- cloud liquid water profiles
- multiple level cloudy conditions with spectrally varying cloud emissivity and reflectivity, consistent with atmospheric conditions (clouds from global model, but cloud amounts are randomized)
- variable surface skin temperature, surface emissivity and surface reflectivity
- variable land coverage with coastlines, lakes, etc.
- variable view and solar zenith angles

NWP Product files



- Thinned Radiance files (HDF and BUFR):
- 4 types:
  a) center of 3 x 3 from every other golf ball, 228 channels. + AMSU and HSB

  b) pc scores using same decimation as a)

  c) Every 7th golfball , all 9 fovs, 228 AIRS channels all AMSU and HSB

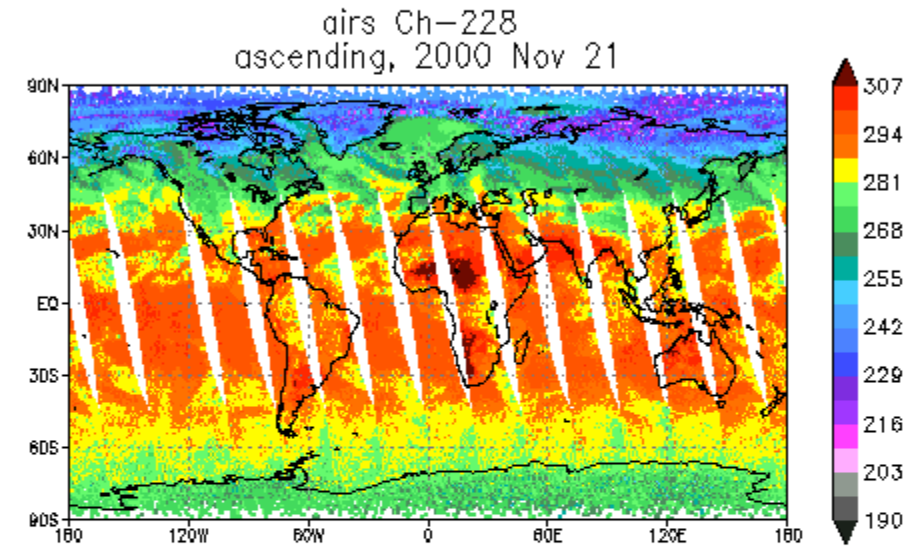
  d) Full resolution AMSU and HSB
- Include cloud detection information
- Full resolution level 2 products – temperature, moisture and ozone.

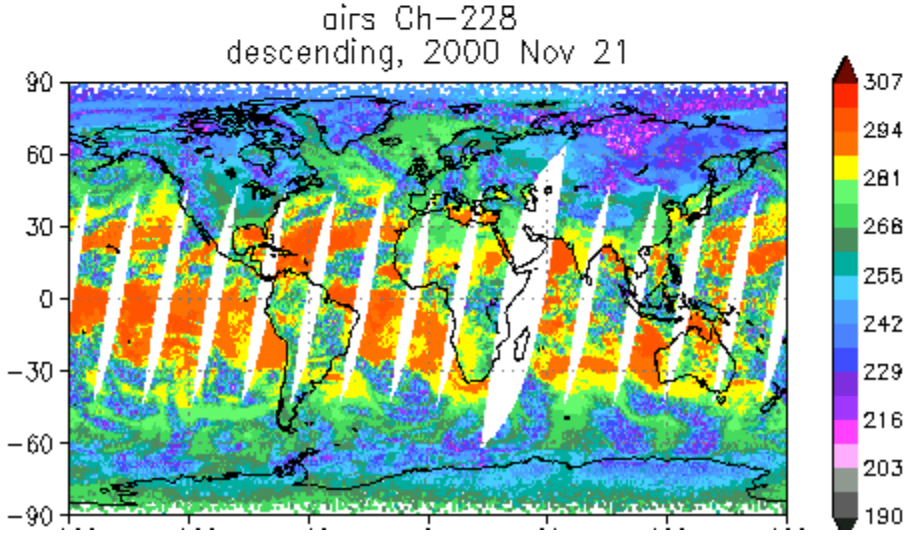
Variables in the BUFR file

- Latitude, Longitude
- Scan and Footprint Positions
- Time (Year, Month, Day, Hour, Minute, Second)
- Satellite Azimuth & Zenith Angles
- Solar Azimuth & Zenith Angles
- Satellite Height
- Cloud Tests
- AIRS/AMSU/HSB Channel Numbers, Frequencies, and Brightness Temperatures
- TBD: Instrument Temperatures and Quality Flag

Welcome to AIRS Near-RealTime Simulations Website

For more information, please contact with: Mitch Goldberg





EOF Scores

Today is: December 5, 2000. Generally data 5 days prior to today are available for display.

Select Year: 2000 **Select Month:** December **Select Day:** 4

Select Products: PC (1-200) **Select ch#:** 1

PC (1-200)
Recon. Score
AMSU (1-15)
HSB (1-5)
Obs. Time
Solar Zenith Angle
Land Fraction
Cloud Score (diff)
Spatial Coherence

Select Spatial Ra ct Min/Max Values:

lonfrom: -180.0
lonto: 180.0
latfrom: -90.0
latto: 90.0

Select Contour On/Off: OFF

Submit Reset

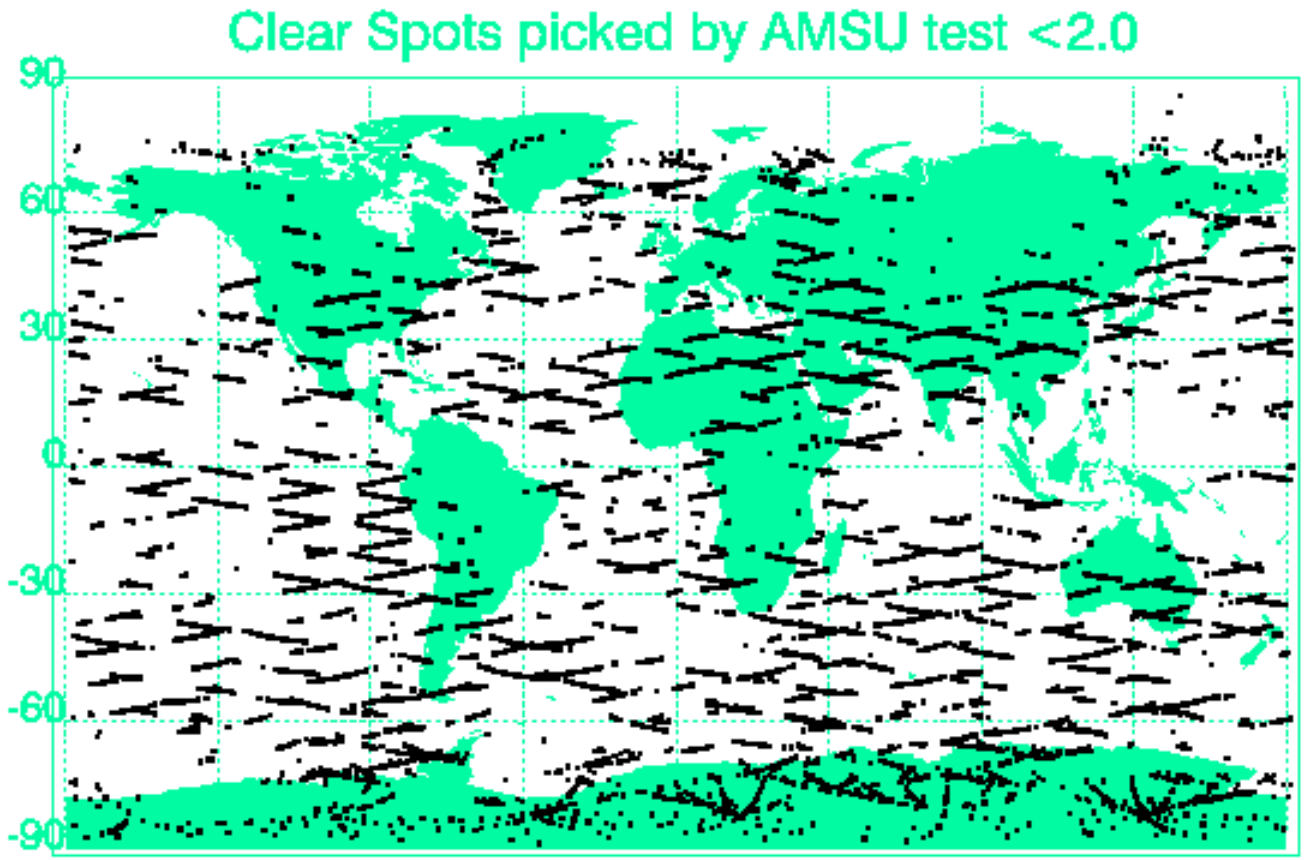
Any comments? please contact Lihang Zhou for additional information.

Principal Components

- $R = a_1 Y_1 + a_2 Y_2 + \ldots a_n Y_n$

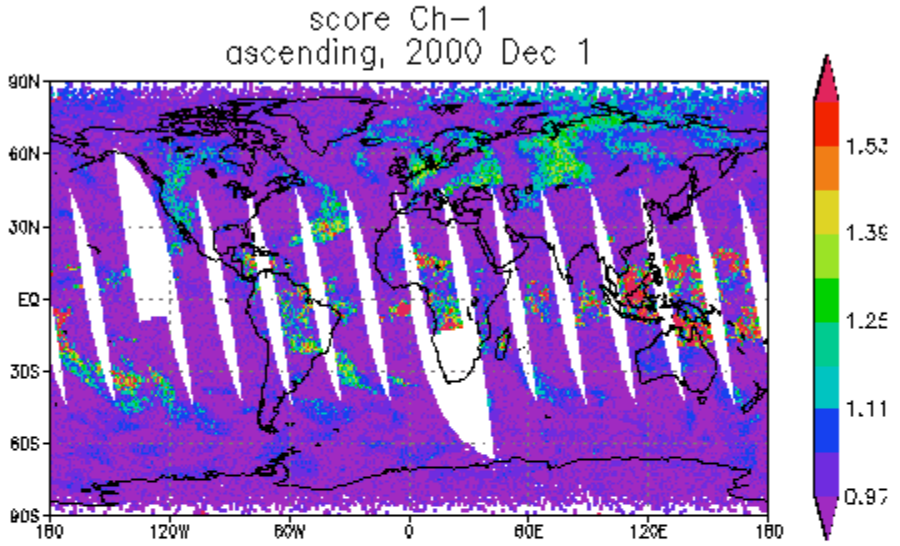
  n = number of principal components
  a = principal component scores (scalar)
  Y = principal components (eigenvectors)

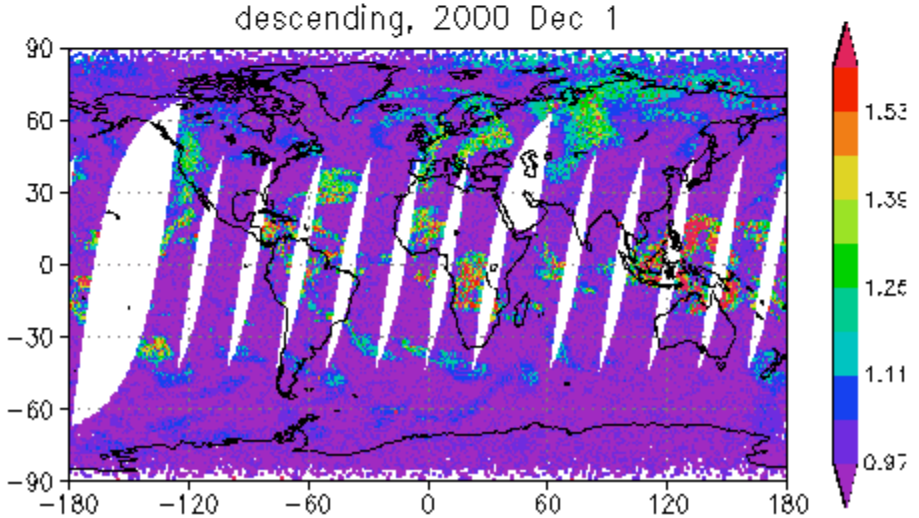
- Need ancillary file of principal components (eigenvectors).

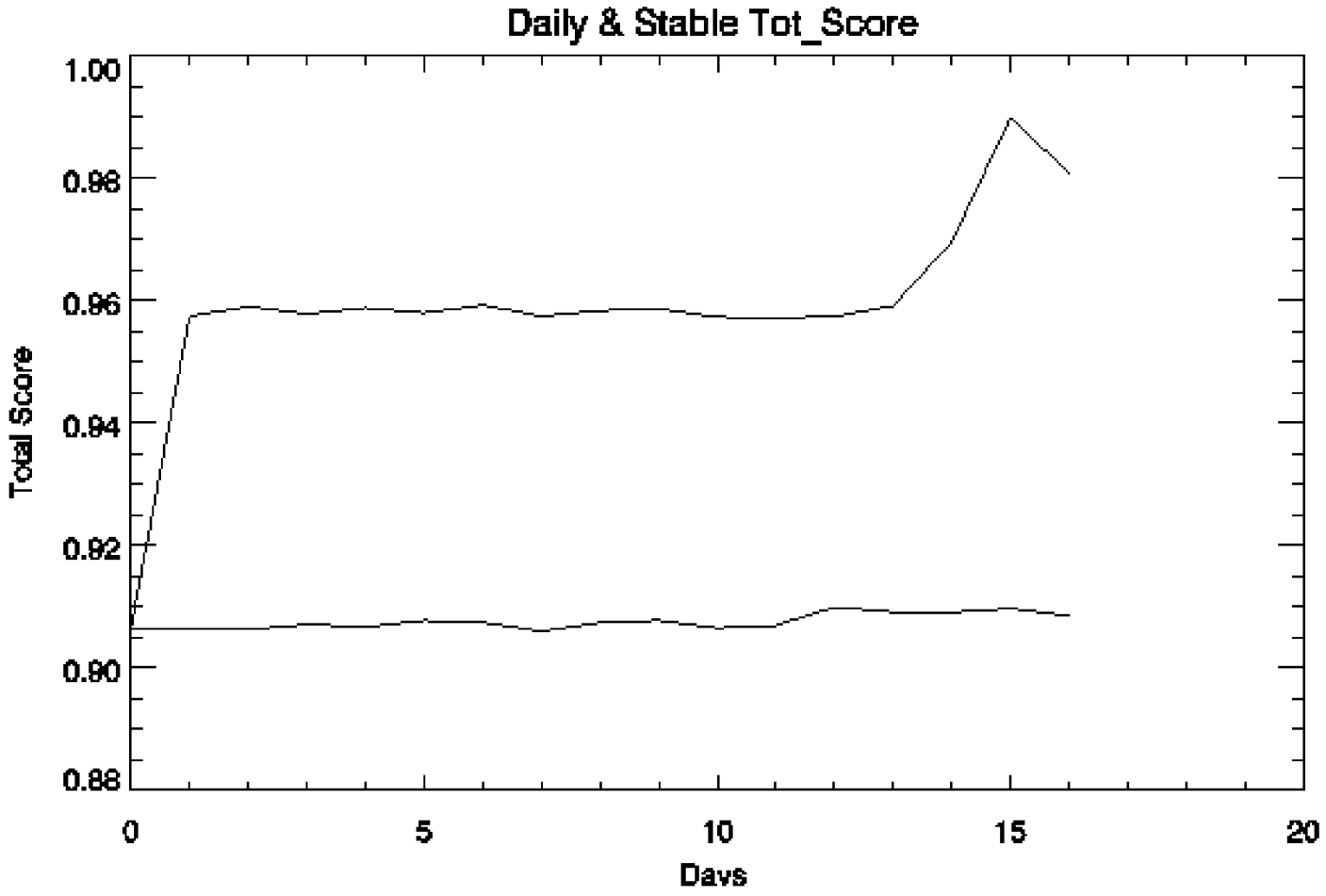

Clear Spots picked by AMSU test <2.0
90
60
30
0
-30
-60
-90

AIRS Near-Real-Time Simulations

- Thinned Radiance Data
- EOF Scores
- Radiance File
- Rad. vs. Freq.
- Level2 regression retrieval
- At 100 Levels
- At 25 Layers
- Profiles
- Error Estimate
- At 100 Levels
- At 25 Layers
- Level2 Truth
- At 100 Levels
- At 25 Layers
- Related Info.
- Background
- AIRS at JPL
- Other Links






Daily & Stable Tot_Score
Total Score
1.00
0.98
0.96
0.94
0.92
0.90
0.88
0
5
10
15
20
Days

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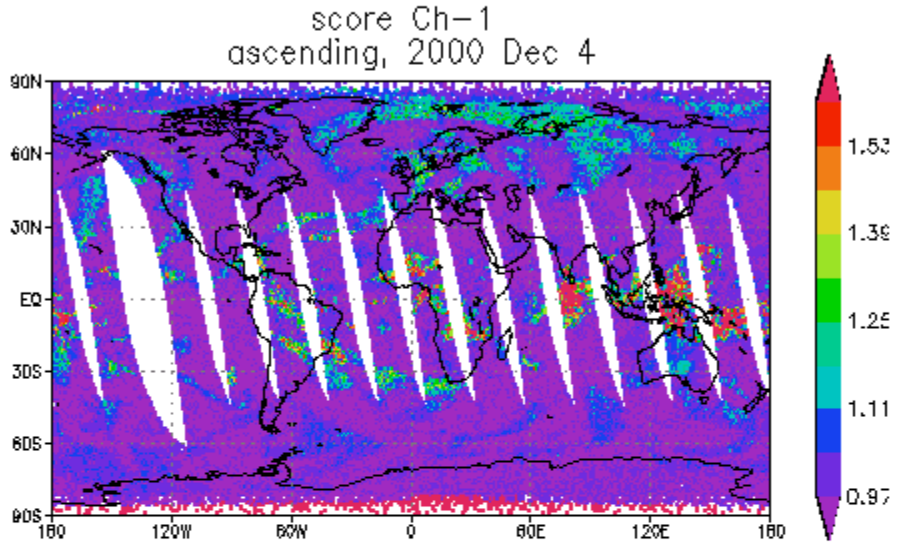
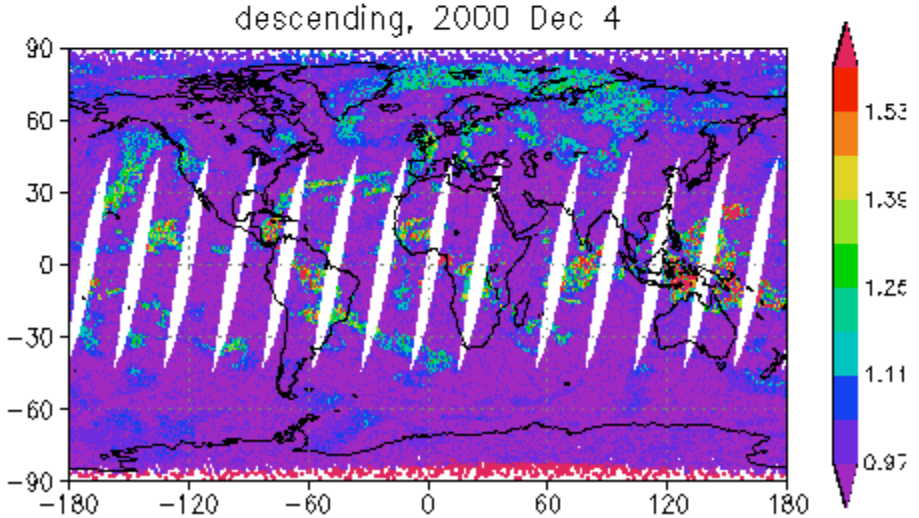
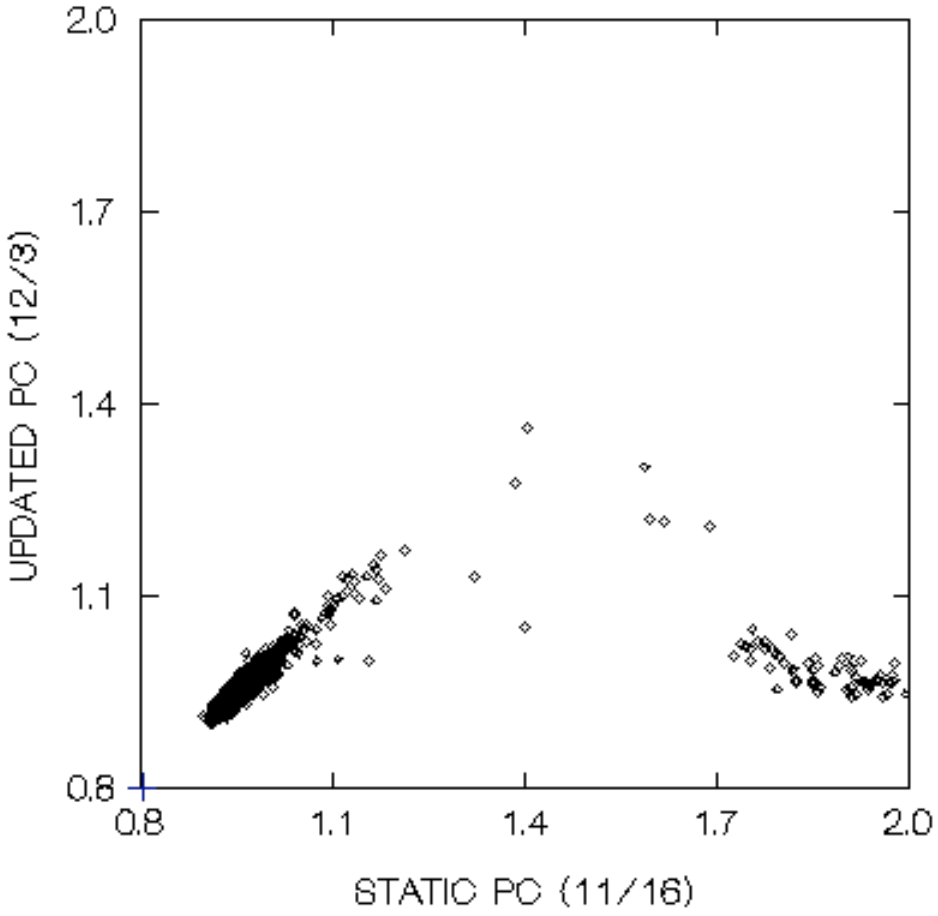




12/4/00 reconstruction scores



Future work

- Create BUFR PC Score files.
- Add level 2 retrieval code
- Improve simulations with more realistic surface emissivities.
- Add radiosonde collocation procedures
- Add all level 2 products to website.
- Add qc trend analysis information to website.
- Monitor reconstruction scores, cloud detection, retrieval errors and radiances
- Compute trends between measured and calculated.

Resources

- Add person to develop monitoring tools.
- Additional disk space and CPUs to support parallel level 2 processing and continue simulation package.
- Current CPU capability will support level 2 processing or simulations.